



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>H04Q 7/38, H04M 1/57</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 97/44981</b></p> <p>(43) International Publication Date: 27 November 1997 (27.11.97)</p>
<p>(21) International Application Number: PCT/FI97/00298</p> <p>(22) International Filing Date: 20 May 1997 (20.05.97)</p> <p>(30) Priority Data: 962128 20 May 1996 (20.05.96) FI</p> <p>(71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): HUOTARI, Seppo [FI/FI]; Harakankuja 6 E 33, FIN-02600 Espoo (FI).</p> <p>(74) Agent: KOLSTER OY AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. In English translation (filed in Swedish).</p>
<p>(54) Title: TRANSMITTING SUBSCRIBER IDENTITY IN MOBILE COMMUNICATION SYSTEM</p> <p>The diagram illustrates a mobile communication system architecture. A mobile station (MS<sub>B</sub>) is shown on the left, connected to a dashed box representing the 'Visited PLMN'. Inside this box are a Mobile Switching Centre (MSC) and a Visitor Location Register (VLR), collectively labeled 'VMSC of subscriber B'. To the right, separated by a dashed line, is the 'Home PLMN of subscriber B'. This home PLMN includes a 'Transit network' (represented by a cloud), a Gateway Mobile Switching Centre (GMSC), and a Home Location Register (HLR). A cloud at the top represents the 'PLMN/PSTN/ISDN of subscriber A'. Numbered arrows indicate the flow of information: 1. From the transit network to the GMSC; 2. From the GMSC to the HLR; 3. From the HLR to the MSC in the visited PLMN; 4. From the HLR to the VLR in the visited PLMN; 5. From the GMSC to the HLR; 6. From the transit network to the MSC in the visited PLMN; 6'. From the MSC in the visited PLMN to the MS<sub>B</sub>; 5'. From the HLR to the transit network; 2'. From the transit network to the GMSC.</p> <p>(57) Abstract</p> <p>The invention relates to a method and a mobile communication system for transmitting the identity of a calling subscriber (subscriber A) to a called subscriber (subscriber B) in a mobile communication system comprising a home location register (HLR) for permanent storage of subscriber data on mobile stations (MS) registered in the network, and at least one visitor location register (VLR) for temporary storage of subscriber data on mobile stations (MS) located in the geographical area monitored by the visitor location register (VLR). The invention is characterized in that the identity of subscriber A is transmitted to the mobile services switching centre (MSC) of subscriber B via signalling that is unrelated to the speech connection.</p>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LJ	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## TRANSMITTING SUBSCRIBER IDENTITY IN MOBILE COMMUNICATION SYSTEM

### FIELD OF THE INVENTION

The invention relates to a method of transmitting the identity of a calling subscriber (subscriber A) to a called subscriber (subscriber B) in a mobile communication system comprising a home location register for permanent storage of subscriber data on mobile stations registered in the network, and at least one visitor location register for temporary storage of subscriber data on mobile stations located in the geographical area monitored by the visitor location register, whereby signalling that is unrelated to the speech connection is transmitted between the switching centres and registers of the mobile communication system.

The invention further relates to a mobile communication system comprising a home location register for permanent storage of subscriber data on mobile stations registered in the network, and at least one visitor location register for temporary storage of subscriber data on mobile stations located in the geographical area monitored by the visitor location register. Signalling that is unrelated to the speech connection is transmitted between the switching centres and registers of the mobile communication system.

### BACKGROUND OF THE INVENTION

A service usually offered by present mobile communication systems is notification of the identity of the calling subscriber (subscriber A) to the called subscriber (subscriber B) during call set-up. This enables subscriber B to identify the caller before answering the call.

Figure 1 in the attached drawing illustrates mobile MS<sub>B</sub> terminating call set-up in a GSM-type mobile communication system. The Figure only shows the relevant network elements as far as call set-up signalling is concerned. At point 1 a call initiated by subscriber A is routed from the network of subscriber A (e.g. a mobile communication system PLMN or a public telephone network PSTN) to the Gateway MSC (GMSC) of the PLMN home network of subscriber B. The GMSC transmits an inquiry (message 2) about routing information to the home location register HLR of subscriber B. The subscriber data on the mobile station MS is permanently stored in the home location register HLR and temporarily in the visitor location register VLR in whose area the mobile station MS is located. During location update, informa-

tion on the visitor location register VLR in whose area subscriber B is located is updated to the home location register HLR of subscriber B. In the example of Figure 1, subscriber B is located in another mobile communication network PLMN. At point 3, the home location register HLR transmits to the visitor location register VLR of subscriber B a request for a roaming number to the PLMN network to be visited. The visitor location register VLR reserves a Mobile Station Roaming Number (MSRN) and transmits the number to the home location register HLR in a reply message 4. The home location register HLR forwards the roaming number in message 5 to the GMSC of the home PLMN which inquired about the routing information. On the basis of the roaming number, the GMSC can then route the call to the mobile services switching centre MSC of subscriber B in the PLMN network visited, if necessary via a transmitting transit network, as in Figure 1, in a set-up message 6. Information on the identity of subscriber A is transmitted to subscriber B in a Calling Line Identity (CLI) field of the set-up message 6. The above kind of transmission of the calling subscriber identity is not always successful, e.g. when subscriber B is located in the area of another PLMN, as in Figure 1. Although call set-up is possible between different networks, all networks do not support the network signalling used in the transmission of the calling subscriber identity. In these cases the called subscriber is notified, in accordance with point 1.4 (version 4.4.1) of the recommendation GSM 02.81, that the CLI is not available.

#### BRIEF DESCRIPTION OF THE INVENTION

It is an object of the present invention to enable transmission of the identity of a calling subscriber to subscriber B even if call set-up does not support transmission of calling subscriber identity, e.g. because subscriber B is located in the area of another network.

This new type of transmission of the identity of subscriber A is achieved with the method of the invention, which is characterized that the identity of subscriber A is transmitted to the mobile services switching centre of subscriber B via signalling that is unrelated to the speech connection.

The invention further relates to a mobile communication system described in the preamble, which, according to the invention, is characterized in that it is arranged to transmit the identity of subscriber A to the mobile services switching centre of subscriber B via signalling that is unrelated to the speech connection.

The invention is based on the idea that the subscriber identity is transmitted in signalling traffic between the switching centres and registers of the mobile communication system, preferably before a call is established.

5 The advantage of such a method for transmission of the identity of subscriber A is that the identity of subscriber A can be transmitted to subscriber B irrespective of the signalling protocols of the networks used for call set-up.

A further advantage of the invention is that the identity of subscriber A can be transmitted to subscriber B to the area of another network, e.g.  
10 abroad.

#### LIST OF DRAWINGS

In the following the invention will be described in greater detail with reference to the accompanying drawings, in which

Figure 1 illustrates call set-up in a GSM system, and  
15 Figure 2 shows transmission of subscriber A identity CLI according to the method of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

The present invention can be applied to any mobile communication system. By way of example, the invention will be described below in connection with the pan-European digital mobile communication system GSM. As to a  
20 more detailed description of the GSM system, reference is made to GSM recommendations and the publication "The GSM System for Mobile Communications", M. Mouly & M. Pautet, Palaiseau, France, 1992, ISBN:2-9507190-0-7.

Figure 1 illustrates signalling associated with call set-up, previously  
25 described in connection with state-of-the-art call set-up. In the following the invention will be described in more detail by means of a preferred embodiment with reference to Figure 1. In this embodiment the transmission of subscriber A identity is associated with message 3 of Figure 1. Using MAP signalling of the GSM system, the home location register HLR transmits a roaming number request by a PROVIDE\_ROAMING\_NUMBER message to the visitor location  
30 register VLR. In the preferred embodiment of the invention, the identity of the calling subscriber, e.g. the phone number or the ISDN number, is added to the PROVIDE\_ROAMING\_NUMBER message, thus enabling identification of subscriber A. As to the other messages of Figure 1, call set-up in a mobile  
35 communication system utilizing the method of the invention conforms with the

above described state-of-the-art technique.

Figure 2 illustrates the transmission of the CLI under call set-up according to the preferred embodiment of the invention. The calling subscriber (subscriber A) states his/her identity when initiating a call. At point 1 this information is forwarded via the PLMN home network of subscriber B to the GMSC in a manner known per se. At point 2 the GMSC forwards the CLI to the home location register HLR of subscriber B, e.g. in connection with the inquiry about routing information. In accordance with the invention, at point 3 the PROVIDE\_ROAMING\_NUMBER message of the request for a roaming number forwards the CLI from the home location register HLR to the visitor location register VLR, which stores the CLI. In accordance with prior art, the visitor location register VLR answers the request for a roaming number by allocating a roaming number MSRN to the call and by transmitting it to the home location register HLR (point 4), which forwards the roaming number to the GMSC for routing of the call (point 5). Once the set-up message 6 arrives from the GMSC, possibly via a public telephone network or another transit network to the mobile services switching centre MSC of subscriber B in the PLMN network being visited, the MSC makes an inquiry about subscriber data to the visitor location register VLR and receives in the answer, among other things, the identity of subscriber A. The MSC forwards the identity of subscriber A to subscriber B in a manner known per se.

The invention has been described above by way of an example with reference to Figures 1 and 2, in a case when call set-up is carried out via the GMSC of the home network of subscriber B. When subscriber A is located in the same network as the home location register HLR of subscriber B, the call does not have to be routed via the GMSC of subscriber B. Neither is there any need for the GMSC of Figure 1 if the switching centre of subscriber A or the gateway MSC of the network of subscriber A has the capacity to communicate directly with the home location register of subscriber B. In this case the call initiated by subscriber A does not have to be transmitted to the GMSC, but instead the switching centre of subscriber A, e.g. a mobile services switching centre, or the gateway MSC of the network of subscriber A transmits the routing inquiry direct to the home location register HLR of subscriber B (message 2' in Figure 1). The home location register HLR transmits a roaming number request to the visitor location register VLR in accordance with the above described embodiment of the invention by forwarding the identity of subscriber A

in message 3. In a reply message 4 the home location register HLR gets a roaming number MSRN in accordance with the set-up signalling described above. The home location register HLR transmits to the switching centre of subscriber A or the network gateway MSC of subscriber A the roaming number  
5 MSRN reserved by the visitor location register VLR in message 5' of Figure 1. Having received this message, the switching centre or the network gateway MSC of subscriber A routes the call to the mobile services switching centre of subscriber B, possibly via a transit network.

Transmission of the identity of subscriber A according to the present  
10 invention is also applicable when both subscriber A and subscriber B are located in the home PLMN of subscriber B. A prerequisite for the use of the method of the invention is that the CLI has been transmitted to the home location register HLR of subscriber B.

The drawings and the description related thereto are only intended  
15 to illustrate the idea of the invention. The details of the mobile communication system and the method for transmitting the identity of subscriber A of the invention may vary within the scope of the claims. Even though the invention has been described above mainly in connection with MAP signalling, the method can be realized by utilising other kinds of signalling between the mo-  
20 bile services switching centres and registers of a mobile communication system.

## CLAIMS

1. A method of transmitting the identity of a calling subscriber (subscriber A) to a called subscriber (subscriber B) in a mobile communication system comprising a home location register (HLR) for permanent storage of subscriber data on mobile stations (MS) registered in the network, and at least one visitor location register (VLR) for temporary storage of subscriber data on mobile stations (MS) located in the geographical area monitored by the visitor location register, whereby signalling that is unrelated to the speech connection is transmitted between the switching centres (GMSC, MSC) and registers (HLR, VLR) of the mobile communication system, **characterized** in that the identity of subscriber A is transmitted to the mobile services switching centre (MSC) of subscriber B via signalling that is unrelated to the speech connection.
2. A method as claimed in claim 1, **characterized** in that the identity of subscriber A is transmitted before call set-up.
3. A method as claimed in claim 1 or 2, **characterized** in that the home location register (HLR) transmits to the visitor location register (VLR) the identity of subscriber A in connection with a request for routing information.
4. A method as claimed in claim 3, **characterized** in that the identity of subscriber A is transmitted in a MAP PROVIDE\_ROAMING\_NUMBER message.
5. A method as claimed in any one of the preceding claims, **characterized** in that subscriber B is located in a visited network.
6. A mobile communication system comprising a home location register (HLR) for permanent storage of subscriber data on mobile stations (MS) registered in the network, and at least one visitor location register (VLR) for temporary storage of subscriber data on mobile stations (MS) located in the geographical area monitored by the visitor location register (VLR), whereby signalling that is unrelated to the speech connection is transmitted between the switching centres (GMSC, MSC) and registers (HLR, VLR) of the mobile communication system, **characterized** in that the mobile communication system is arranged to transmit the identity of subscriber A to the mobile services switching centre (MSC) of subscriber B via signalling that is unrelated to the speech connection.



7. A mobile communication system as claimed in claim 6, **characterized** in that the home location register (HLR) is arranged to transmit the identity of subscriber A to the visitor location register (VLR) in connection with a request for routing information.

5           8. A mobile communication system as claimed in claim 7, **characterized** in that the home location register (HLR) is arranged to transmit the identity of subscriber A in a MAP PROVIDE\_ROAMING\_NUMBER message.

10           9. A mobile communication system as claimed in claim 6, 7 or 8, **characterized** in that subscriber B is located in a visited network.

Fig. 1

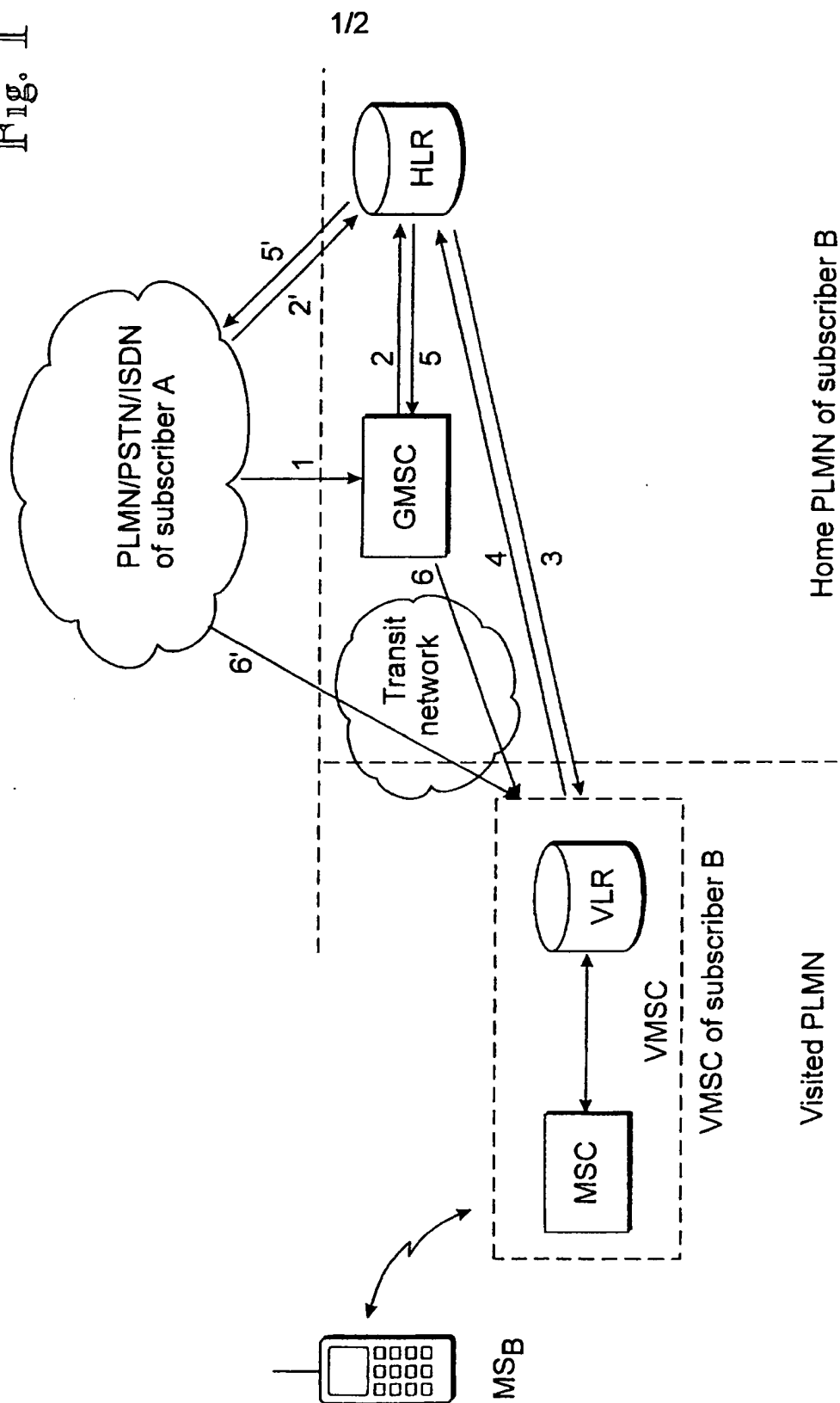
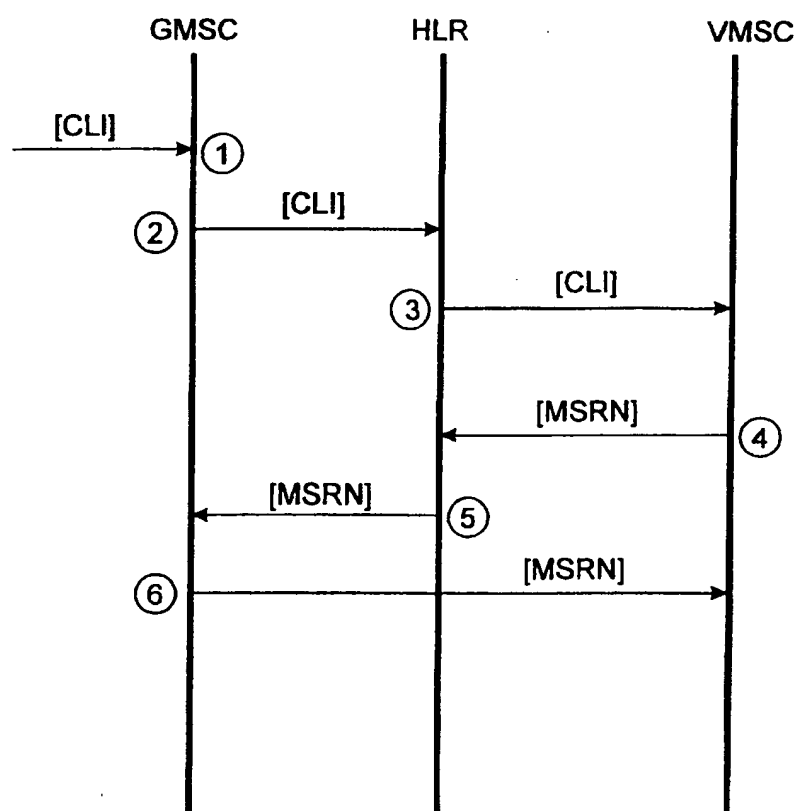


Fig. 2



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 97/00298

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38, H04M 1/57

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CLAIMS, WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9421090 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 15 Sept 1994 (15.09.94), see the whole document. --	1,6
P,A	JP 8154263 A (KAWAMOTO HIROSHI), 25 November 1994 (25.11.94) -- -----	,1,6

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

4 Sept 1997

Date of mailing of the international search report

11-09-1997

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Bo Gustavsson

Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

06/08/97

International application No.

PCT/FI 97/00298

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9421090 A1	15/09/94	AU 672293 B	26/09/96
		AU 6223294 A	26/09/94
		CN 1103541 A	07/06/95
		EP 0647384 A	12/04/95
		EP 0659228 A	28/06/95
		FI 945185 A	03/11/94
		JP 7506710 T	20/07/95
		NO 950837 A	03/03/95
		SE 501009 C	17/10/94
		SE 9300721 A	05/09/94
		US 5467381 A	14/11/95
JP 8154263 A	25/11/94	NONE	